CLAIMS:

1. A method of designing a chamber for attachment of a duct to reduce noise in said duct, said chamber having a peripheral chamber height h_c to reduce noise in a duct having a height h by, said duct being separated from said chamber by a membrane having a tension T and membrane length L, including the steps of:
   a) setting the chamber height h_c, the membrane length L, and tension T to predetermined values;
   b) setting incident wave frequency f such that angular frequency $\omega = 2\pi f$, c_0 = speed of sound;
   c) determining the radiation pressure acting on the upper surface of the membrane facing away from the chamber, p_{+rad} caused by a unit modal amplitude;
   d) determining the radiation pressure acting on the lower surface of the membrane facing towards the chamber, p_{-rad} caused by a unit modal amplitude;
   e) determining the radiation pressure by reflection of the radiated waves into the cavity by the walls of the chamber, p_{-ref} caused by a unit modal amplitude;
   f) calculating vibration amplitude of the jth *in-vacuo* mode V_j using the modal impedance yielded from p_{+rad}, p_{-rad}, and p_{-ref};
   g) calculating transmitted wave p_t using calculated vibration amplitude V_j from step f);
   h) calculating transmission loss TL for f;
   i) repeating steps b) to h) by varying wave frequency f to calculate transmission loss TL for different f; and
   j) determine a frequency range f_1 and f_2 from the transmission loss TL versus f spectrum such that transmission loss TL within f_1 to f_2 is higher than or equal to a threshold transmission loss TL_{cr}

   and wherein at the one of the chamber height h_c, membrane length L or tension T are varied and steps a) to j) are repeated to obtain an optimized noise-reduction spectrum for said duct.

2. The method of Claim 1 further including the step of:
   k) repeating steps a) to j) by varying the tension T to determine an optimal tension T_{opt}.

3. The method of Claim 2, wherein the tension T is varied from 0 to $\rho_0 c_0^2 h^2$, ρ_0 = fluid density of the medium contained in the chamber.

4. The method of Claim 2 further including the step of:
   l) repeating steps a) to k) by varying the chamber height h_c to determine optimal chamber height h_{copt}.

5. The method of Claim 2 further including the step of:
   m) repeating steps a) to k) by varying membrane length L to determine optimal membrane length L_{opt}.

6. The method of Claim 1, wherein wave frequency f is varied from 0 to $\frac{c_o}{2h}$ such that the angular frequency $\omega = 2\pi f = 0$ to $\frac{\pi c_o}{h}$, c_0 = speed of sound.

7. The method of Claim 1, wherein said chamber is filled with air.

8. The method of Claim 1, wherein said chamber is filled with helium.

9. The method of Claim1, wherein the threshold transmission loss TL_{cr} is $10\log_{10}\left[1+\frac{1}{4}\left\{\left(1+\sqrt{6h_c L}\right)-\left(1+\sqrt{6h_c L}\right)^{-1}\right\}^2\right]$

10. The method of Claim 9, wherein the threshold transmission loss TL_{cr} is 10dB.

11. A chamber attaching to a duct having a height h for reducing noise in said duct, including a peripheral chamber height h_c and membrane length L, and a membrane having a tension T separating said chamber from said duct, wherein any one of the chamber height h_c, the membrane length L, or the tension T is set to an optimal value determined by any one of the methods of Claims 1 to 10.